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(54) Orthopaedic Instrument.

(57) An orthopaedic instrument for guiding means for preparing the distal end of a human femur to receive an endoprosthetic femoral component characterised by a base component (6,7,8) provided with guide means (8) for guiding cutting means for shaping all of the necessary surfaces (1,2,3,4,5) to receive the femoral component to be fitted once said base component (6,7,8) is fitted to the bone, means (31,27,40,60,80) for aligning said base component on the bone and means (9,27,28) for attaching said base component to the bone after alignment.

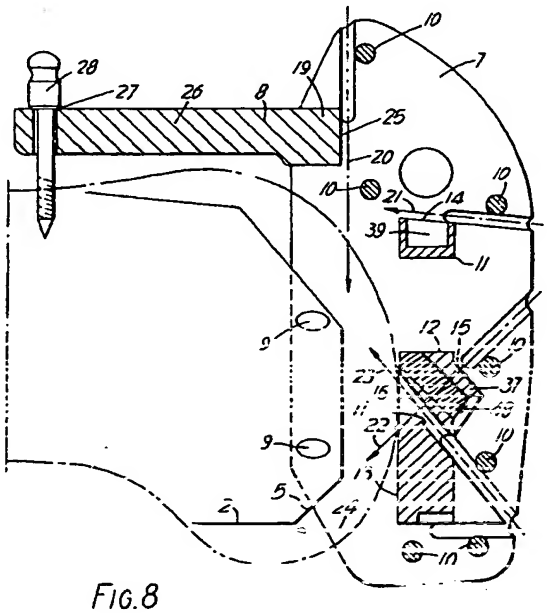

FIG.8

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This invention relates to an orthopaedic instrument for guiding means for shaping the distal end of a human femur to receive an endoprosthetic femoral component.

Instruments to place femoral endoprosthetic components in the knees perform two basic functions:

Control of power and other tools to provide accurate fixation surfaces of bone that match implant geometry.

Position of fixation surfaces relative to bone and soft tissue architecture to appropriately orient the prosthetic component.

In addition instruments must provide the necessary flexibility to accommodate the variations in geometry and surgical complications that are encountered within the patient population. They must also meet the disparate needs of surgeons who wish to follow different methodologies when performing the surgical replacement of the knee.

Conventional femoral components usually have five planar fixation surfaces which match the bone to the implant, as follows:

1. The distal cut surface
2. The posterior cut surface
3. The anterior cut surface
4. The anterior chamfer cut surface
5. The posterior chamfer cut surface

Some existing femoral components have marginally different forms of fixation surface, ie. no posterior chamfer, or the anterior chamfer surface formed as a curved surface rather than a flat one. In general it has been found that flat surfaces are nevertheless advantageous since they are easier to prepare using oscillating saws.

A number of different surfaces can be used to control the positioning of the essentially planar blades of front or side cutting oscillating saws for shaping the planar surfaces.

Flat metallic blocks on which the saw blade is rested, obviously rely to some extent on the skill of the surgeon to avoid tilting of the saw blade, as may happen when the saw encounters a localised harder section of bone, or when the saw blade has a long travel beyond the guide surface.

Slots having small clearance relative to the thickness of the saw blade may also be used. In general these offer better control of the saw blade than blocks, but they can impede visibility at the operative site. Simple slots do not provide clearance for the tooth set on the saw blade, but a number of solutions have been proposed to this problem. These include variable thickness slots formed by assemblies of elements. The slot is temporarily made deeper to allow passage of the saw blade teeth and subsequently reduced to more closely hold the main body of the blade in position. Alternatively, the slot is made open ended on one side so that the blade may be introduced into it from the side without having to pass the teeth through the slot. Variations in the design of the saw blade itself have also been used. These may have zero net set on the teeth or provide a local clearance behind the teeth so that the total blade and tooth form can be passed through a close clearance slot.

Fulcrum type cutting guides are described in Orthomet's Patent WO88/04912, and also in Osteonic's EPA0366488A2. These consist of an upper and a lower guide surface which are linearly separated along the plane of intended cut by the saw blade. By providing a separation between the two surfaces the saw blade, including its tooth set may be introduced between the two surfaces and then biased against them to control the cutting plane. The separation of the guide surfaces normal to the plane of operation of the saw blade is matched to the thickness of the saw blade. The choice of orientation of the guide surfaces is chosen so that any deviation by the surgeon in maintenance of the contact between the saw blades and either of the guide surfaces results in conservative removal of bone, which may be corrected subsequently.

The femoral components may be located with six degrees of freedom relative to the patients femoral geometry. These can be expressed in a cartesian manner relative to orthogonal anatomical reference planes.

Angulation:	Varus-Valgus, Flexion-Extension, Internal-External Rotation.
Linear Position:	Inferior-Superior, Anterior-Posterior Medial-Lateral

To position the component on the bone a number of datum features of the patients anatomy, and their relative location as controlled by soft tissue structures at the knee may be utilised.

Two major schools of thought exist as to the optimum method to provide consistent functional placement.

Independent Femoral Anatomical placement; In this method the femoral component is positioned on the femur by referencing datum features on the femur itself.

Referenced to the Tibial Position; In this method the position of the femoral component is controlled relative

to the proximal cut of the tibia. The ligaments and other soft tissue structures at the knee joint will in this case affect the femoral components position.

The positional referencing, according to different methodologies is performed surgically prior to placing the femoral component.

Varus-Valgus and Flexion-Extension. Angulation of the component in these planes is usually performed simultaneously. The reference datum is either the femoral shaft centreline or the line joining the centre of the knee and the hip joints. Two major methods are currently used:

Intramedullary Alignment. A rod is introduced through the centre of the knee into the intramedullary space and passed up the inside of the femur to the internal isthmus, locating the axis of the femoral shaft. This technique has been found to be very reliable, but is thought by some surgeons to be overly invasive and in patients where there is excessive bowing of the femoral shaft, or where the intramedullary space is blocked, for example by a long stemmed hip implant, it may not be available.

Extramedullary Alignment. An external guide rod is aligned with the anterior cortex of the femur, or to the centres of the knee and femoral head.

Internal-External Rotation. The tangent to the posterior condyles of the femur is the datum in the anatomical approach.

In the referenced technique internal-external rotation is controlled by balancing of the flexion gap so that the medial and lateral compartments of the joint are equally spaced or tensed.

Inferior-Superior. In the anatomical approach a fixed amount of bone is resected from the distal femur. The amount of resection is normally the same as the thickness of the distal portion of the implant component where bone stock has not been eroded away. In the referenced technique the amount of bone to be removed is adjusted relative to the proximal tibial cut to allow for the total thickness of both the femoral and tibial components.

Anterior-Posterior. In the anatomical approach the anterior-posterior position of the femoral component may be referenced to a number of alternative features at the distal femur. These include the posterior condyles, where an amount of bone is resected from the posterior condyles which corresponds either to the posterior thickness of the femoral component or to some proportion or fixed amount in excess of this. Alternatively anterior features of the distal femur may act as references, usually either the anterior cortex or the deepest point of the patella groove. In cases where a femoral implant with a large intramedullary stem is to be used the position of the femoral component may need to be chosen to match the position of the implant stem within the intramedullary canal in which it must fit. In the referenced approach a posterior resection of the femur is performed so that the flexion gap of the joint matches the thickness of the femoral and tibial components. In general all these approaches result in either an anterior or posterior cut being performed first. Subsequently the opposite cut is performed so that the implant will fit across these resected surfaces.

Medial-Lateral. The medial-lateral placement of the component is usually performed by eye to match the rim geometry of the resected bone surface performed by all the previous cuts. In cases where a large intramedullary stemed implant is to be used the position may be dictated by the fit of the stem into the intramedullary cavity.

Current techniques generally require the sequential use of alignment and cutting guides. In all current systems multiple cutting guides are needed to fully prepare the distal femur for the implant. Because these sequential operations require the assembly and disassembly of instrument configurations and the use of intermediate datums cut onto the bone there are penalties in terms Of time of operation and accuracy. The current invention is intended to address these inadequacies whilst incorporating the flexibility to allow for alternative operative approaches to be used in placement of the femoral component.

According to the present invention an orthopaedic instrument for guiding means for shaping the distal end of a human femur to receive an endoprosthetic femoral component is characterised by a base component provided with guide means for guiding cutting means for shaping all of the necessary bony surfaces to receive the femoral component to be fitted once said base component is fitted to the bone, means for aligning said base component on the bone and means for attaching said base component to the bone after alignment.

Preferably the guide means includes means for guiding a saw blade.

The invention can be performed in various ways but one embodiment will now be described by way of example and with reference to the accompanying drawings in which

Figure 1 is a side elevation of a conventional endoprosthetic femoral component;

Figure 2 is a diagram showing the various reference directions for a knee relative to the tibia;

Figure 3 is an isometric view of a base component of the orthopaedic instrument according to the present invention;

Figure 4 is a plan view from above of the base component shown in Figure 3;

Figure 5 is a front elevation of the component as shown in Figure 3;

Figure 6 is a partial cross-sectional plan view from above of the component as shown in Figure 3 with the

partial cross-sectional portion taken on the line VI-VI of Figure 7;
Figure 7 is an end view of the component as shown in Figure 3;
Figure 8 is a cross-sectional view taken on the line VIII-VIII of Figure 5;
Figure 9 is an isometric view of a posterior condylar alignment accessory for use with the base component;
Figure 10 is an end elevation of the accessories shown in Figure 9;
Figure 11 is an front elevation of the accessories as shown in Figure 9;
Figure 12 is a plan view of the accessory as shown in Figure 9;
Figure 13 shows the posterior condylar alignment accessory in position on the base component and carrying an extramedullary alignment and drill guide;
Figure 14 is a front view of the extramedullary alignment and drill guide as shown in Figure 13;
Figure 15 is an end elevation of the drill guide as shown in Figure 14 partly in section;
Figure 16 shows the posterior condylar alignment accessory carrying a sizing stylus;
Figure 17 is an isometric view of the base component provided with condylar defect screws;
Figure 18 shows the base component and posterior condylar alignment accessory provided with an intramedullary boss and an intramedullary rod;
Figure 19 is an end view of various accessories in position on the base component;
Figure 20 is a front elevation of the accessories in position as shown in Figure 19;
Figure 21 shows alternative accessories for extramedullary alignment in position on the base component;
Figure 22 is a plan view of the accessories shown in Figure 21;
Figure 23 shows an exploded assembly of the apparatus and including spacer blocks for application to the bone;
Figure 24 is a diagrammatic view showing the use of spacer blocks; and
Figure 25 is a plan view of three spacer blocks for use in the assembly as shown in Figure 23.

Figure 1 is a side elevation of a conventional femoral component having five planar fixation surfaces which match the bone to the implant. Reference numeral 1 indicates the distal cut surface, reference numeral 2 the posterior cut surface, reference numeral 3 the anterior cut surface, reference numeral 4 the anterior chamfer cut surface and reference numeral 5 the posterior chamfer cut surface.

The femoral component can be located with six degrees of freedom, relative to the patients femoral geometry and Figure 2 shows the various reference directions for a patients knee relative to the tibia. The various degrees of freedom can be expressed in a cartesian manner relative to orthogonal anatomical reference planes as follows:

Angulation:	Varus-Valgus, Flexion-Extension, Internal-External Rotation.
The Linear Position:	Inferior-Superior, Anterior-Posterior and Medial-Lateral

The orthopaedic instrument according to the present invention comprises a base component which is used with various accessories. The base component, as shown in Figures 3-8 comprises two side cheeks 6, 7 joined by a number of parallel guide members 8. These structures are used to control the positioning of an oscillating saw blade so that it matches the shape of the femoral component to be implanted. The geometry of the guide members 8 allows for the cutting of all five cuts to place a femoral component without any repositioning of the base component relative to the bone.

Each side cheek 6, 7 has a pair of angled through holes 9 such that four pins (not shown) can be used to position the instrument in place on the distal femur. The positioning of these is such that the pins pass into bone that will not be removed from the femur during preparation for the implant.

The parallel guide member 8 joining the side cheeks 6, 7 are either manufactured integrally with them, for example by casting or machining, fabricated by welding or assembled for example by screwing and dowelling.

Seven of the parallel guide members 8 are shown in this embodiment as part threaded headed rods 10 which are screwed across from one cheek 6 to the other 7. This allows for the use of alternative diameter rods to accommodate differing thicknesses of saw blade as sold by various manufacturers. Differing thicknesses of saw blade may also be used for each of the cuts. A thin short blade may be most appropriate to the access and cutting of the posterior and posterior chamfer surface, where the required travel of the saw blade is short and longer blades may result in less accurate cuts due to excessive deflection at the cutting teeth. When cutting the anterior and distal cuts a longer and thicker blade may be needed to give the required cut length and stiffness of blade to avoid deviation when harder sections of bone are encountered. In addition the use of separable rod structures allows them to be manufactured from harder materials, or to be coated in some way to minimise wear and the generation of metallic debris due to the rubbing action of the saw blade.

The size of the guide members is kept as small as possible to maximise the visibility of the bone through the cutting frame, consistent with providing enough control of the saw blade.

The other three guide members 8 are provided by cross bars 11, 12 and 13, 19 which have guide surfaces 14, 15, 16, 17, 18 and 25 respectively.

The directions of cut between the guide surfaces form five different cuts which are indicated by arrows 20, 21, 22, 23 and 24 in Figure 8. This Figure shows how the base component is located on a femur to be prepared. The shape of the original femur is indicated by broken line 26 and the shaped surfaces to align with the surfaces 1, 2, 3, 4 and 5 shown in Figure 1 carrying the same reference numerals.

Between the two guide surfaces 16, 17 used for the anterior and posterior chamfer there are portions of two halves of a female screw threaded hole 30. These allow threaded bolts 31 to be inserted to stabilise the base component against the distal femur when bone loss is present due to degenerative changes as shown in Figure 17.

A male boss feature 37 is provided on the cross bar 12. This and a ledge portion 38 on the cross bar 13 form means of attaching a number of accessories.

A counterbore 39 is provided on cross bar 11. This allows accessories which are used across a range of guide sizes to be appropriately positioned relative to the intramedullary stem on the femoral component for any of the base component sizes.

The cross bar 19 carries an extension which provides an anterior anchor 26 and is provided with a drill guide 27. This anterior anchor 26 allows a hole to be drilled into the anterior cortex of the femur to allow a fixation pin 28, shown in Figure 8, to be inserted, which provides a significantly enhanced stability for the instrument on the bone.

A posterior condylar alignment accessory 40 shown in Figures 9-12 which attaches to the base component using the boss 37 and ledge 38 arrangement via a finger screw 41 as shown in Figure 13 which screws into a threaded hole 48 in the boss 37 after passing through a hole 49 in a main portion 42 provided with two thin arms 43 which can be located against the posterior condyles. These are made as thin as possible whilst maintaining enough stiffness and toughness to withstand repeated operative use and act as a condylar sled.

The main portion 42 has a slide 44 which is used as a means of attaching further accessories. This is illustrated in figure 13 which shows the accessory 40 with its condylar sled 43 and extramedullary alignment guide 60 attached.

Anteriorly the accessory 40 has an inclined parallel slot 45 and hole 46 which are used in conjunction with a sizing stylus 50 as shown in figure 16. A marker line crosses the slot 45. The angulation of the holes 46 and slot 45 allows a single stylus 50 to be used to check sizing of the base component prior to performing any cuts. The stylus 50 is arranged to move its indicating tip 51 along the locus of the front of the anterior flanges of a range of sizes of femoral component relative to the posterior arms 43. When the sizing stylus 50 is pushed up against the anterior cortex of the femur the appropriate femoral component size is indicated by the position of the marker line 47 relative to a scale 52 on the stylus 50.

The extramedullary alignment and drill guide 60 depicted in Figure 13 is shown in Figures 14 and 15 and comprises a guide block 61 and extension 62.

The guide block 61 is shaped to fit into the slide 44 in the posterior condylar alignment accessory 40 and a peg 63 engages into the counterbore 39 on the cross bar 11 as shown in Figure 15. The guide block 61 is provided with a clamp member 67 one end of which is threaded at 68 to receive a locking hand nut 69. Thus the guide may be securely fastened to the posterior accessory 40. A retaining screw 67a engages the clamp member 67 to prevent complete removal thereof when the hand nut 69 is released.

The guide 60 may be similarly positioned into the other positioning accessories that fit onto the base component which have slideways equivalent to the slideway 44 on the posterior accessory 40.

A number of parallel through holes 64 in the drill guide 60 are used with long alignment rods 65 as shown in Figure 21 to orient the instrument assembly relative to the femoral geometry. These are positioned to overly the anterior surface of the femur. Alternative holes are available to allow placement of the guide rods as close to the patient as possible. The preferred technique, is to align to the femoral head from the centre of the knee for varus-valgus alignment. Flexion-extension alignment is performed by moving the base component until the alignment rod 65 is parallel with a line joining the centre of the knee and the greater trochanter. Alternative extramedullary alignment methods may use the line of the anterior femoral shaft for varus-valgus orientation. In this case an alternative drill guide (not shown) is used in which the holes 64 for the alignment rod are angled to compensate for the valgus angle of the femoral shaft relative to the mechanical axis of the femur, ie. the line between the hip and knee centres.

The drill guide 60 also incorporates a drill bushing 66 which extends through the clamp member 67. This allows an entry hole to be formed into the intramedullary cavity. The position of this entry hole is controlled so that it corresponds with the position of the intramedullary stem 70 on the femoral implant. In this way a further degree of repeatability of technique is gained, current methods relying on 'eyeballing' of this entry hole, and the removal of bone is such that it will not compromise the fixation of the intramedullary feature of the implant in this area. In existing techniques the intramedullary entry hole may conflict with the fixation surface prepared for the implant's intramedullary feature.

As described with regard to Figure 17, threaded bolts 31 can be provided which act as condylar defect screws. These can be placed in the screwholes 30 of the base component when it is positioned against the distal femur and allow the guide to be repositioned to make allowance for bone loss caused by degenerative changes, or to adjust the varus-valgus orientation of the bone guide.

An intramedullary boss 75 is provided as shown in Figure 18. The boss 75 fits into the slide 44 on the posterior condylar accessory 40. It also similarly fits in the alternative positioning accessories to be described. The boss 75 is available in a number of different valgus angles as indicated by reference numeral 76, and can be fitted in two opposite senses to suit either right or left limbs. The boss forms a guide for the placement of an Intramedullary Rod 77 which is passed up into the bone to align the assembly with the femoral canal.

As discussed previously surgeons may have different preferences in their choice of alignment method and datums. The current system aims to include as much versatility as possible without compromising the ease of performing any one of the approaches when chosen.

There are various femoral alignment methods: Anterior-Posterior Position. The instrument described so far used the posterior condyles to position the femoral component. Various instruments for other methods are shown in Figures 19, 20, 21 and 22 in which the same reference numerals are used to indicate similar parts to those used in other Figures.

An intramedullary alignment accessory is shown in Figure 19 which allows the intramedullary rod 77 to be used as the datum for positioning of the femoral component. This is necessary when long intramedullary stems are to be implanted. This accessory makes use of an another means for locating the extramedullary and pilot drill guide and the intramedullary boss, and consists of a posterior condylar alignment accessory with adjustable condylar sleds. In this construction a device 80 similar to the accessory 40 is provided but the arms 43 are replaced by a pair of adjustable gauges 81 which can move in relation to the main portion 42 and which can be clamped by a screw clamp 82. An alignment gauge 83 similar to the sizing stylus 50 can be moved in hole 46 and slot 45 and locked by clamp 84. A further difference is that the boss 75 is replaced by a support member 85 which is located in slide 44 but also has a peg 86 which acts in a similar manner to the peg 63 on the drill guide 60.

An anterior cortex/patella groove alignment accessory is shown in Figure 21 and 22 which allows this anterior structure of the femur to be used to place the femoral component, the various parts described in the other Figures being assembled together as shown.

The instruments described so far intend neutral alignment in Internal-external rotation. According to the way that the proximal tibia is resected it may be advantageous to externally rotate the femoral component relative to the natural anatomy. This is achieved by the construction shown in Figure 23 in which spacer blocks 90 can be used which fit on to the arms 43 of he accessory 40. Figure 25 shows three blocks 90 which are marked as shown at 91 to show the degree of offset. Figure 24 shows how the rotation is achieved. The bone in this Figure and in Figure 25 being indicated by reference numeral 100.

To use the instrument the base component is initially assembled with the chosen femoral alignment accessory. In this case the technique will be described with respect to use of the posterior condylar alignment accessory 40. The extramedullary alignment and drill guide 60 is then introduced into the slide 44 on the alignment accessory, so that the pin 63 on the guide engages against the bottom face of the counterbore 39 in the cross bar 11 and a long alignment rod 65 is placed in a hole 64 so that the rod lies just above the skin on the patient's thigh and the guide 60 is clamped by the hard nut 69. The assembled instrument is then positioned so that the alignment rod 65 passes over the centre of the hip and is parallel to the femoral shaft in the sagittal plane. In cases of condylar bone loss the condylar defect screws 31 are introduced and adjusted to stabilise the base component relative to the damaged distal femur.

With the instrument correctly aligned the sizing stylus 50 is introduced into the posterior condylar alignment accessory 40 and pressed up against the anterior cortex. The size indication is then read from the scale marking 52. If the size reading does not correspond to the femoral guide currently in position then the base component is replaced with one of the appropriate size. The procedure performed so far is then repeated. The sizing stylus 50 is removed. With the appropriately sized assembly correctly positioned the extramedullary alignment and drill guide 60 is used to drill a pilot hole into the intercondylar area. The extramedullary alignment and drill guide 60 is then removed and replaced with an intramedullary boss 75, appropriately oriented for the left or right limb and of a valgus angle setting determined from preoperative x-rays or surgeon preference. An intramedullary rod 77 is then introduced through the boss 75 until it engages the isthmus of the femoral canal. The assembly is consequentially repositioned relative to this new datum in its flexion extension and varus-valgus alignment. Anterior-posterior position is now reset by pressing the posterior condylar alignment accessory's skids 43 up against the posterior condyles. If intramedullary alignment is not possible or required the preceding steps are omitted.

The positioned assembly is now pinned in place onto the distal femur using four pins passed through the

holes 9 in the side cheeks 6, 7. These are introduced either by hammering, drilling or screwing, and may have heads to allow capture of the jig.

A hole is now drilled in the anterior cortex of the femur using the drill guide 27 on the anterior anchor 26 and the fixation pin 28 is inserted to stabilise the assembly.

All accessories are now removed from the base component. The cuts for the placement of the femoral component are now made using an oscillating saw. In general these will be made in the following order:

1. Anterior cut
2. Posterior cut
3. Posterior chamfer cut
4. Anterior chamfer cut
5. Distal cut

The distal femur is resected last to allow the piece of bone which will be removed to support the guide while the other cuts are being made.

Where there is any doubt about the choice of component size, based on the stylus measurement and/or preoperative templating the largest of the possible sizes is chosen first. The anterior cut is made first to assure that the correct size is being used, and this ensures that the initial anterior cut will not have removed bone needed for the fixation of a smaller sized component.

Claims

1. An orthopaedic instrument for guiding means for preparing the distal end of a human femur to receive an endoprosthetic femoral component characterised by a base component (6,7,8) provided with guide means (8) for guiding cutting means for shaping all of the necessary surfaces (1,2,3,4,5) to receive the femoral component to be fitted once said base component (6,7,8) is fitted to the bone, means (31,27,40,60,80) for aligning said base component on the bone and means (9,27,28) for attaching said base component to the bone after alignment.

2. An orthopaedic instrument as claimed in claim 1 characterised in that the base component (6,7,8) is provided with means (8) for guiding cutting means to shape five planar surfaces on the bone.

3. An orthopaedic instrument as claimed in claim 1 or claim 2 characterised by an anterior anchor (26) provided on said base component (6,7,8) to provide means (28) for anchoring said base component (6,7,8) to the anterior cortex of the femur with which the instrument is to be used.

4. An orthopaedic instrument as claimed in claim 1, claim 2 or claim 3 characterised in that said alignment means includes one or more accessories (40,60,80) adapted for attachment to said base component (6,7,8).

5. An orthopaedic instrument as claimed in claim 4 characterised by including a posterior alignment accessory (40) provided with location means (43) which can locate against the posterior condyles of the bone and which act as a condylar sled.

6. An orthopaedic instrument as claimed in claim 5 characterised in that said posterior alignment accessory (40) has means (44) for attaching further accessories.

7. An orthopaedic instrument as claimed in claim 5 or claim 6 characterised in that said posterior alignment accessory (40) has means for attaching a sizing stylus (50).

8. An orthopaedic instrument as claimed in claim 7 characterised in that said sizing stylus (50) and said posterior alignment accessory (40) have co-operating indicators (47,52) to indicate the appropriate femoral component size required.

9. An orthopaedic instrument as claimed in claim 5, claim 6, claim 7 or claim 8 characterised in that said posterior alignment accessory (40) has means for attaching an extramedullary alignment guide (60).

10. An orthopaedic instrument as claimed in claim 9 characterised in that said extramedullary alignment guide (60) incorporates means (65) for orientating said instrument relative to the femoral geometry of the bone.

11. An orthopaedic instrument as claimed in claim 10 characterised in that said orientating means (65) overlie the anterior surface of the femur to align to the femoral head from the centre of the knee for varus-valgus alignment.

12. An orthopaedic instrument as claimed in claim 10 characterised in that said orientating means (65) provide extramedullary alignment by using the line of the anterior femoral shaft for varus-valgus orientation.

13. An orthopaedic instrument as claimed in claim 10 or claim 11 characterised in that alternative positions (64) are provided for the orientating means (65) for left or right legs

14. An orthopaedic instrument as claimed in claims 9 to 13 characterised in that said extramedullary alignment guide (60) incorporates means (66) for guiding means for forming an entry hole in the intramedullary cavity to correspond with the intramedullary stem (70) of a femoral implant component.

15. An orthopaedic instrument as claimed in any one of the preceding claims characterised by condylar alignment means (31) for use with condylar defects.

16. An orthopaedic instrument as claimed in claim 15 characterised in that said condylar alignment means (31) are provided by threaded bolts (31) which act as condylar defect compensation screws and which are provided on said base component (6,7,8).

17. An orthopaedic instrument as claimed in any one of the preceding claims characterised by means (75) for guiding the placement of means to align the instrument with the femoral canal.

18. An orthopaedic instrument as claimed in claim 17 characterised in that said guide means (75) is shaped and dimensioned for use with either right or left limbs.

19. An orthopaedic instrument as claimed in claim 17 or claim 18 characterised in that a number of said guide means (75) are provided which indicate different valgus angles.

20. An orthopaedic instrument as claimed in claim 17, claim 18 or claim 19 characterised in that said guide means (75) is adapted to fit into said alignment accessory (40).

21. An orthopaedic instrument as claimed in claims 17 to 20 characterised in that said guide means (75) forms a guide for the placement of an intramedullary rod (77) which can be passed up into the bone to align the instrument with the femoral canal.

22. An orthopaedic instrument as claimed in any one of the preceding claims characterised by an intramedullary alignment accessory comprising a posterior condylar alignment accessory (80) provided with adjustable gauges (81) and which can be attached to the base component (6,7,8).

23. An orthopaedic instrument as claimed in any one of the preceding claims characterised by an anterior cortex/patella groove alignment accessory which can be attached to the base component (6,7,8).

24. An orthopaedic instrument as claimed in any one of the preceding claims characterised by means to externally rotate the femoral component to be fitted relative to the natural anatomy of the femur and which includes means (90) for rotating said base component relative to the bone.

25. An orthopaedic instrument as claimed in claim 24 characterised by spacer blocks (90) adapted for attachment to said alignment accessory (40).

26. An orthopaedic instrument as claimed in any one of the preceding claims characterised in that said guide means (8) includes means (14,15,16,17,25) for guiding a saw blade.

FIG.1

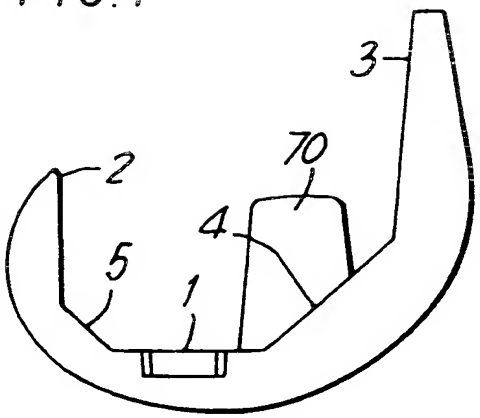
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FIG.2

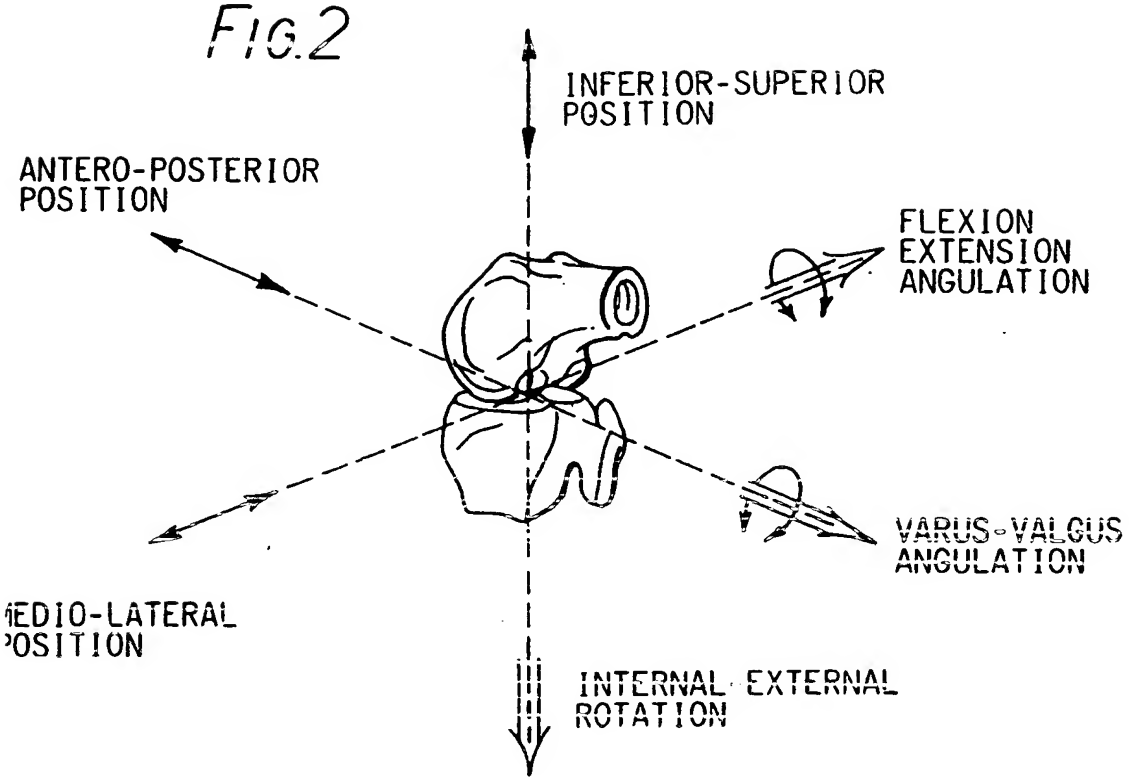
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FIG 3

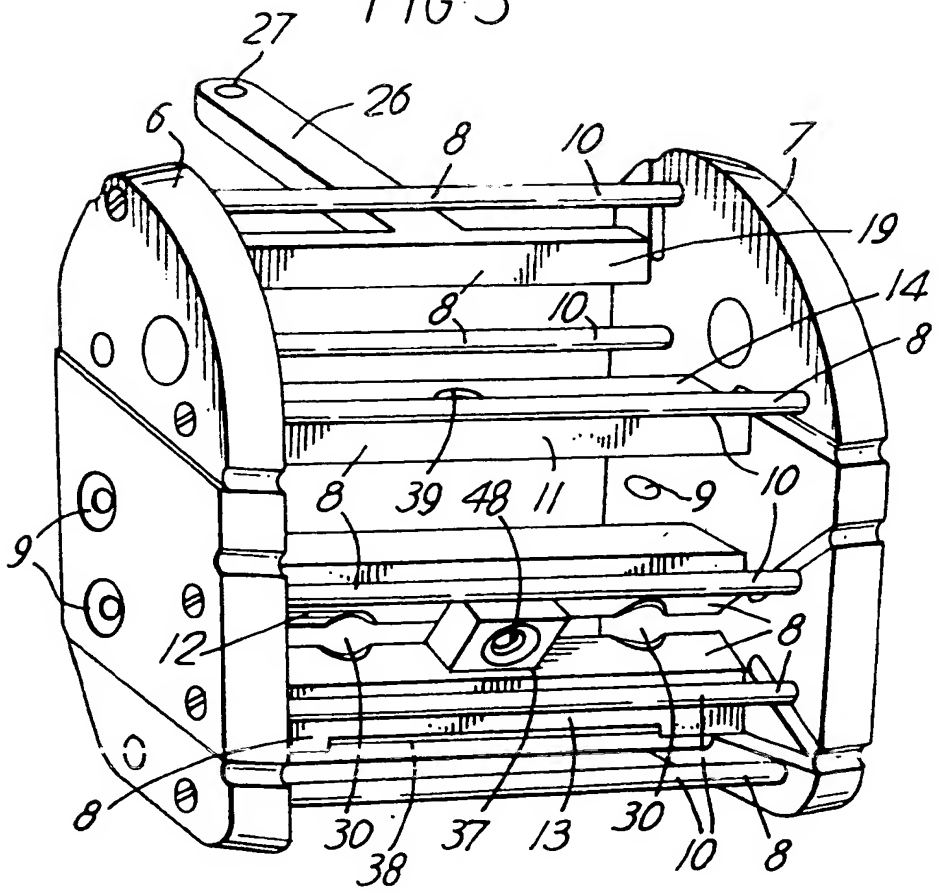
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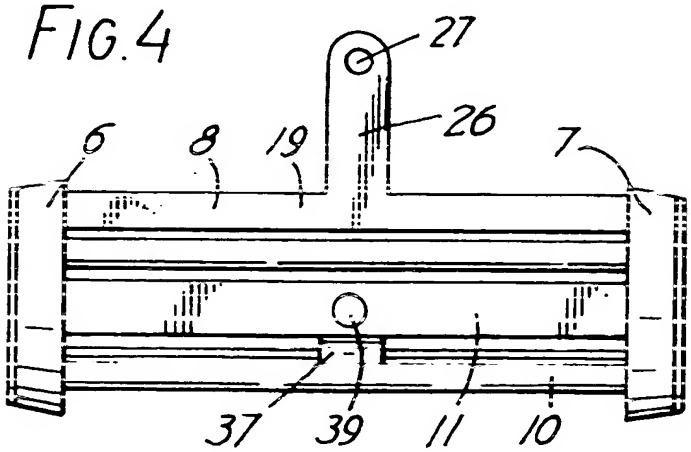
FIG.4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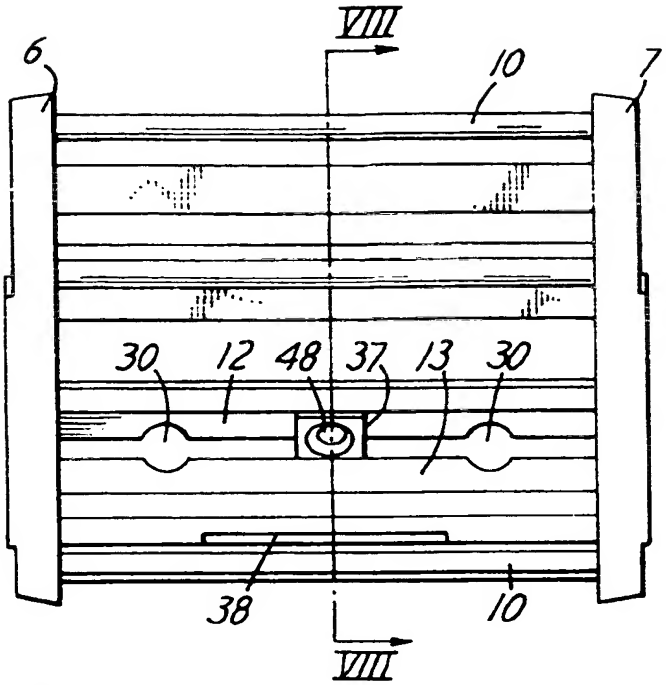

FIG.5

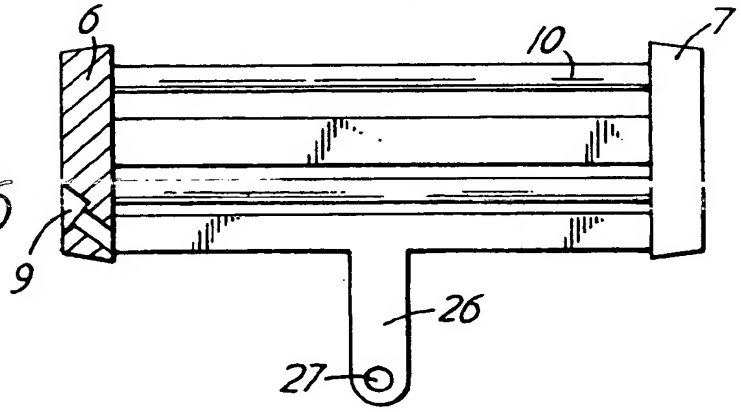

FIG.6

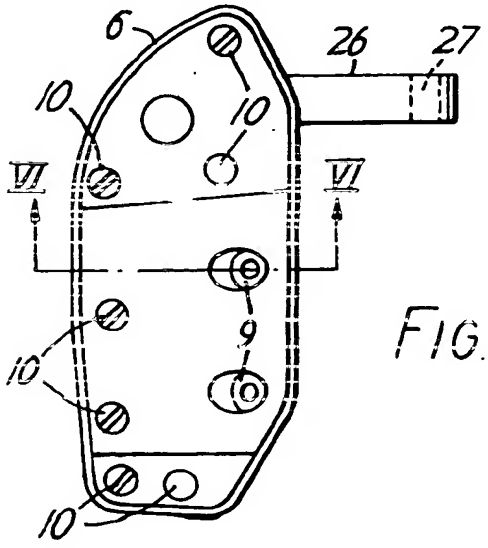

FIG.7

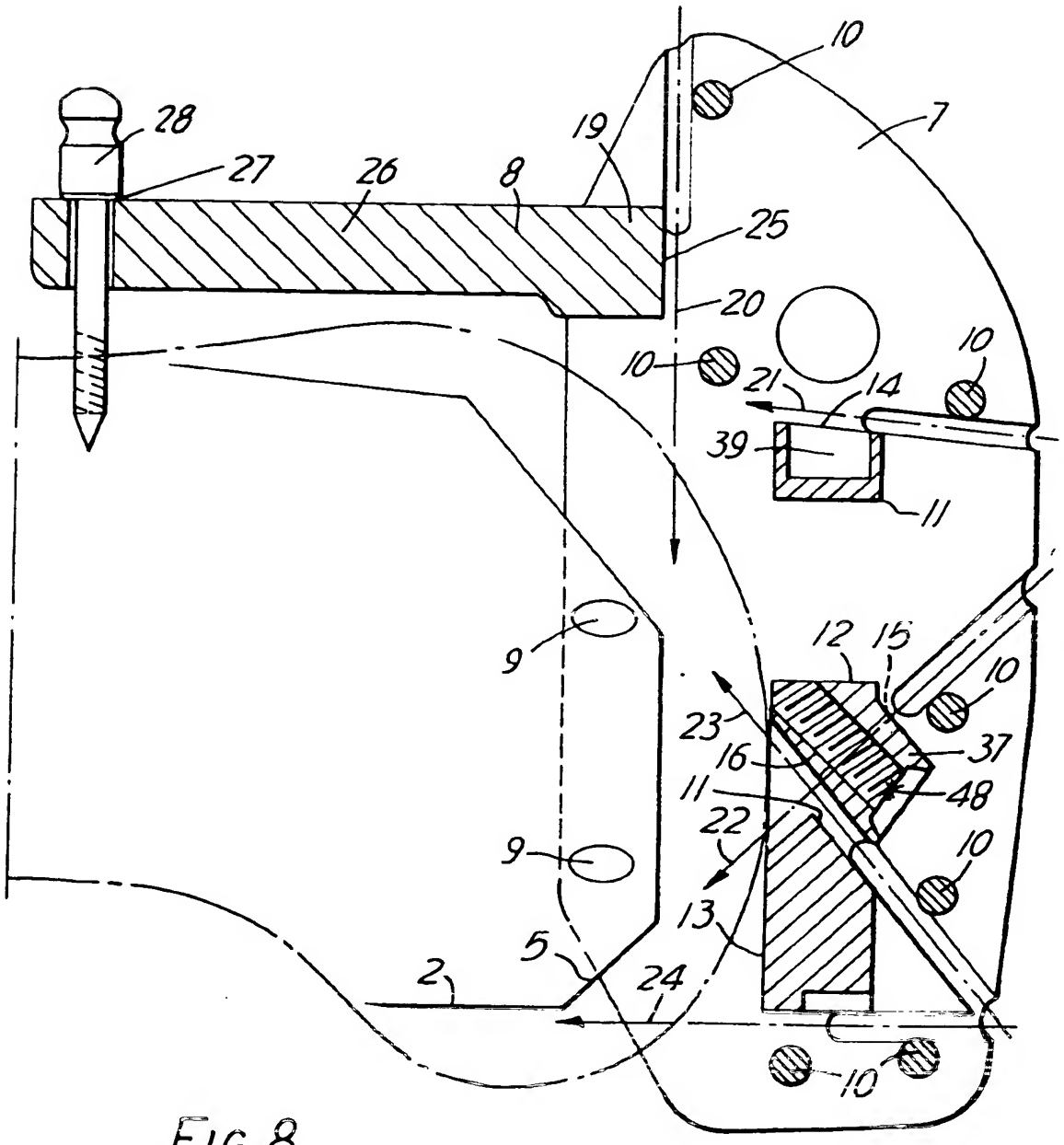
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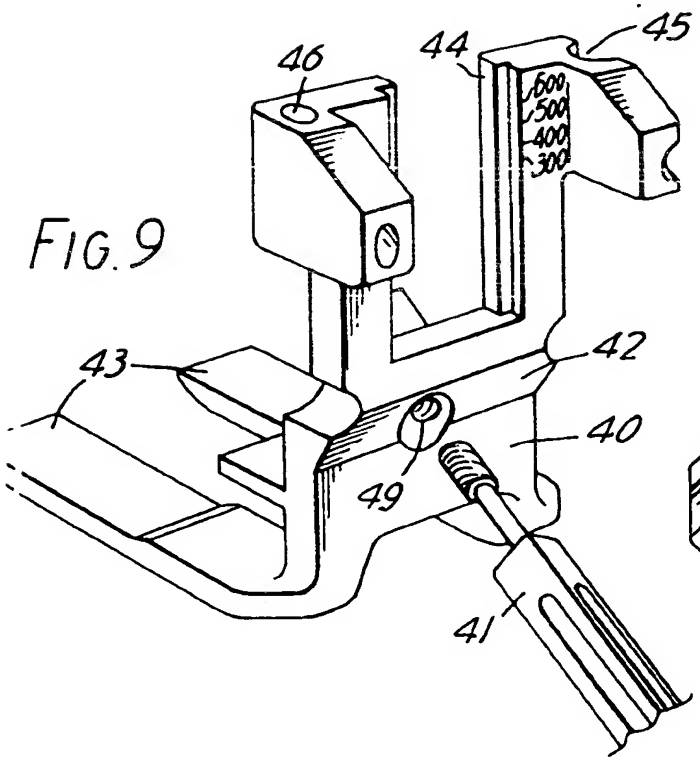
FIG.8

FIG. 9



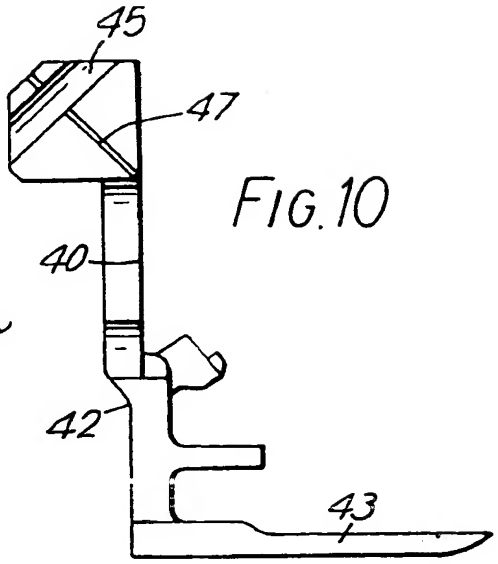


FIG. 10

FIG. 11

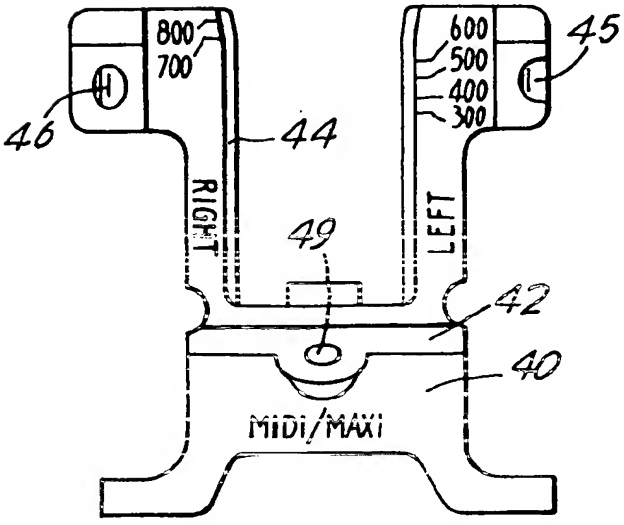


FIG. 12

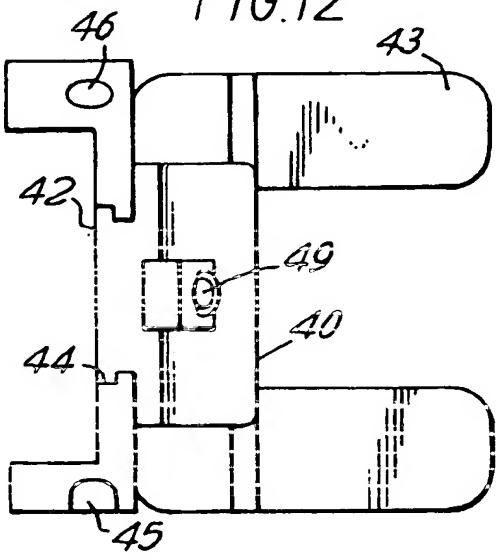


FIG. 13

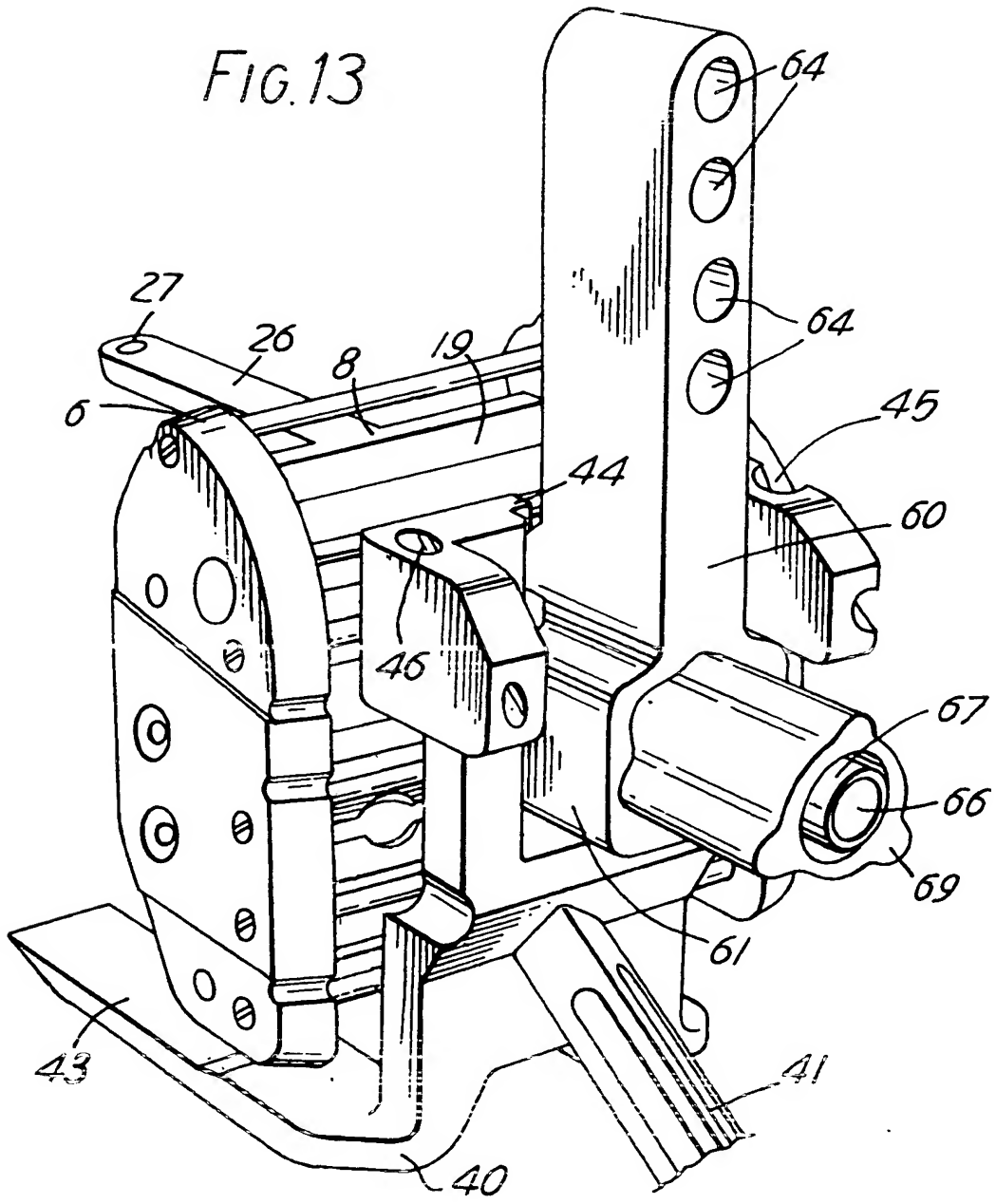


FIG.14

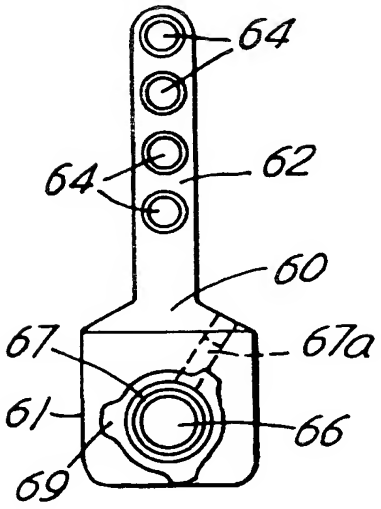


FIG.15

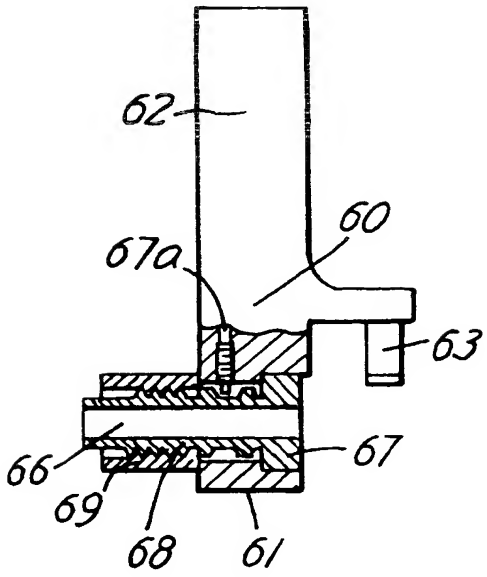
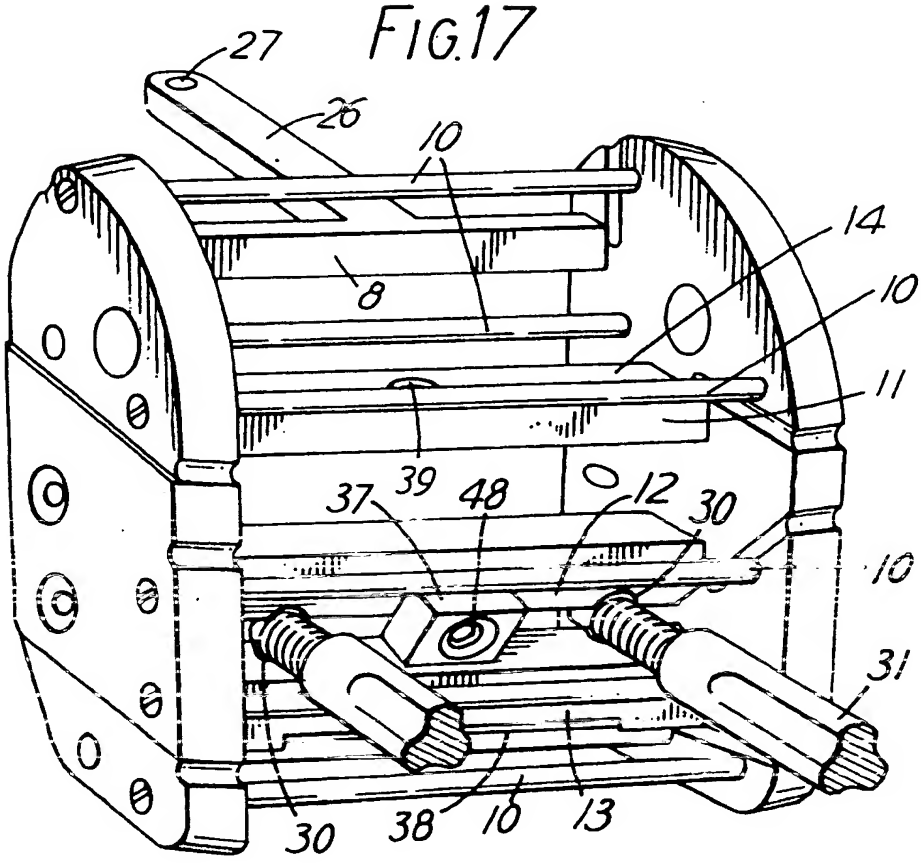


FIG.17



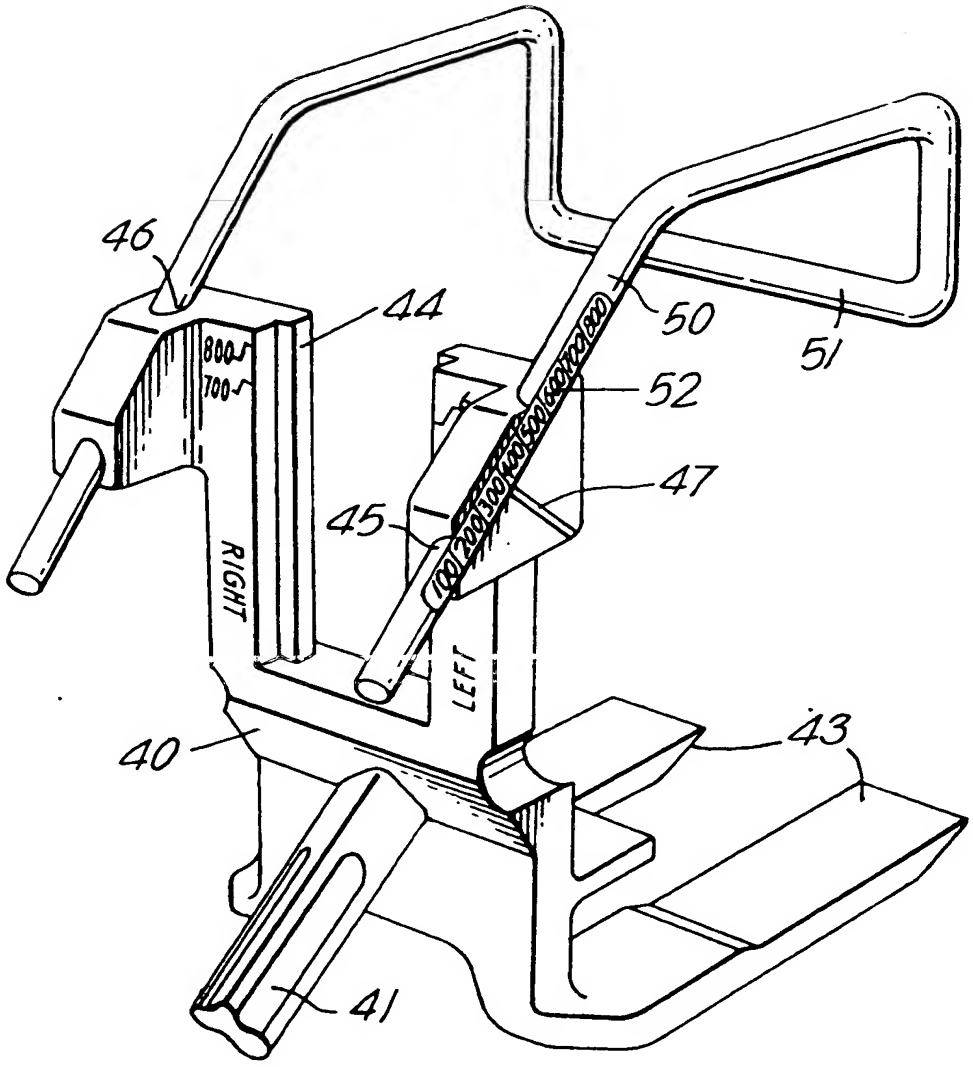


FIG.16

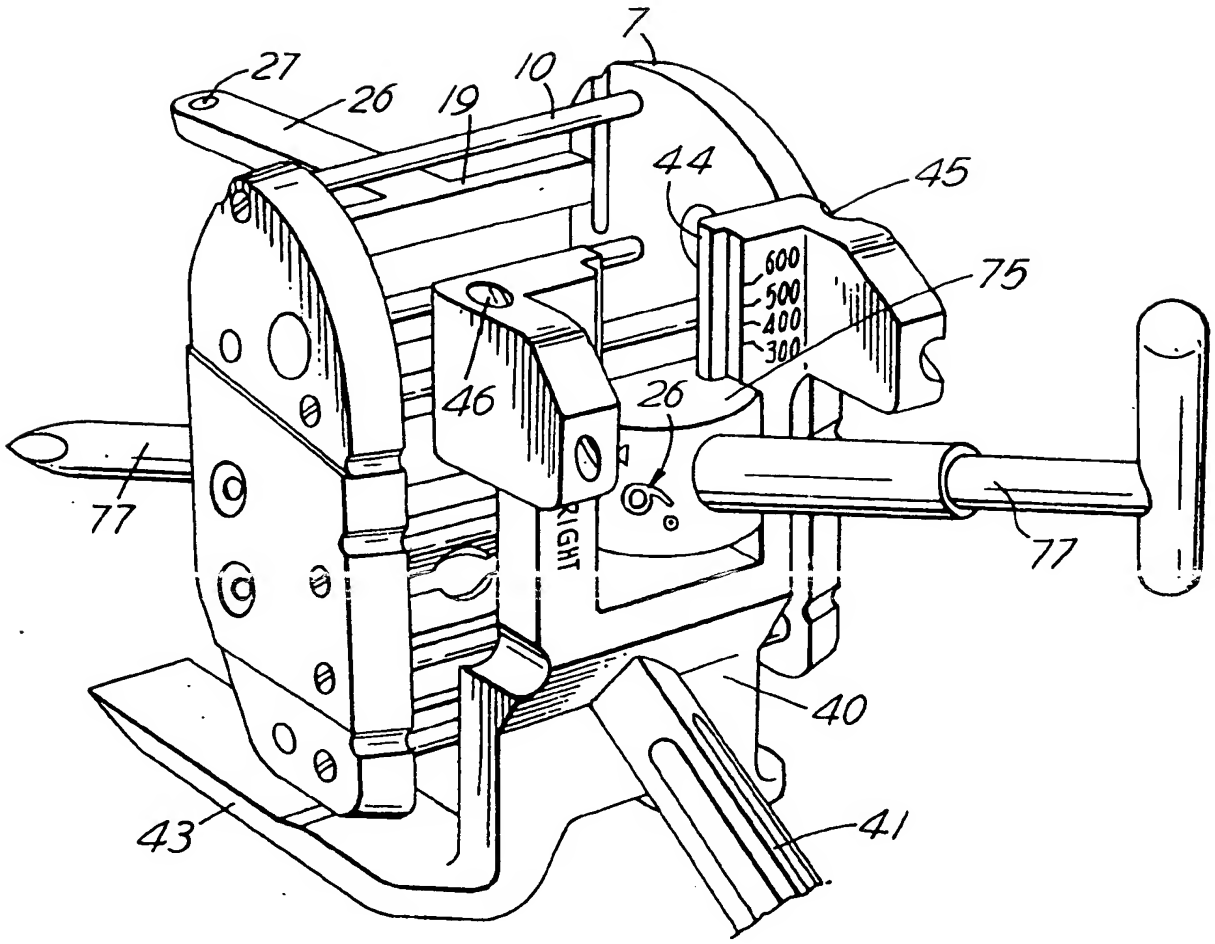


FIG.18

FIG.19

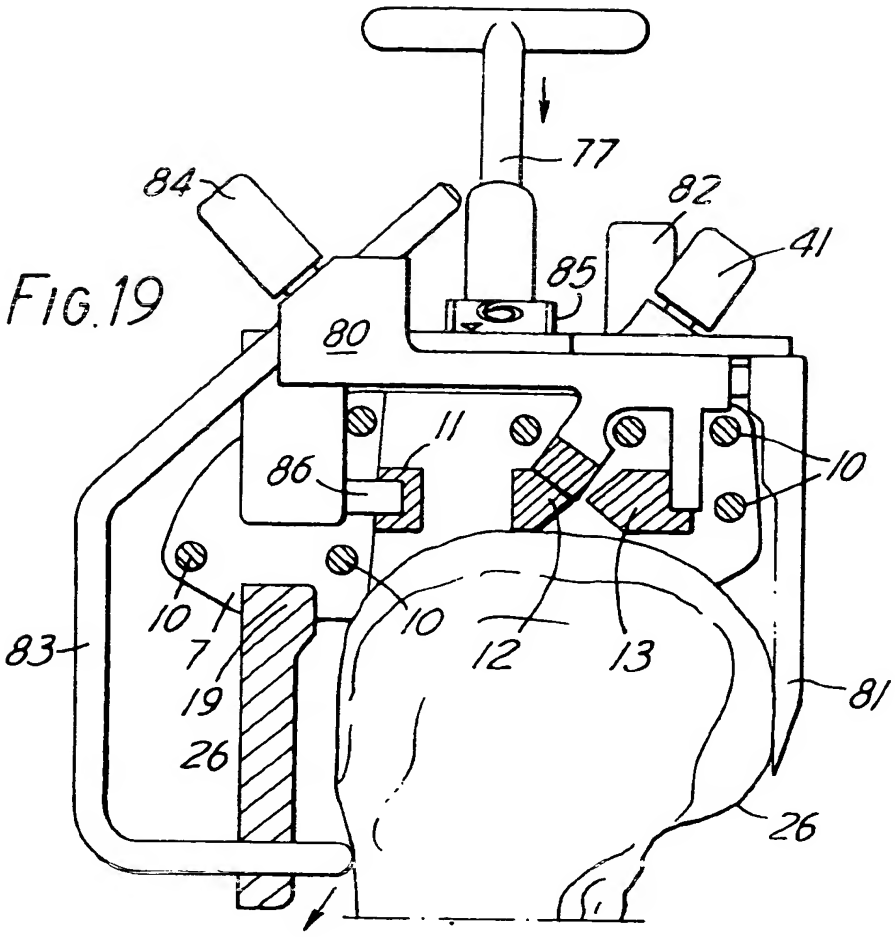

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FIG.20

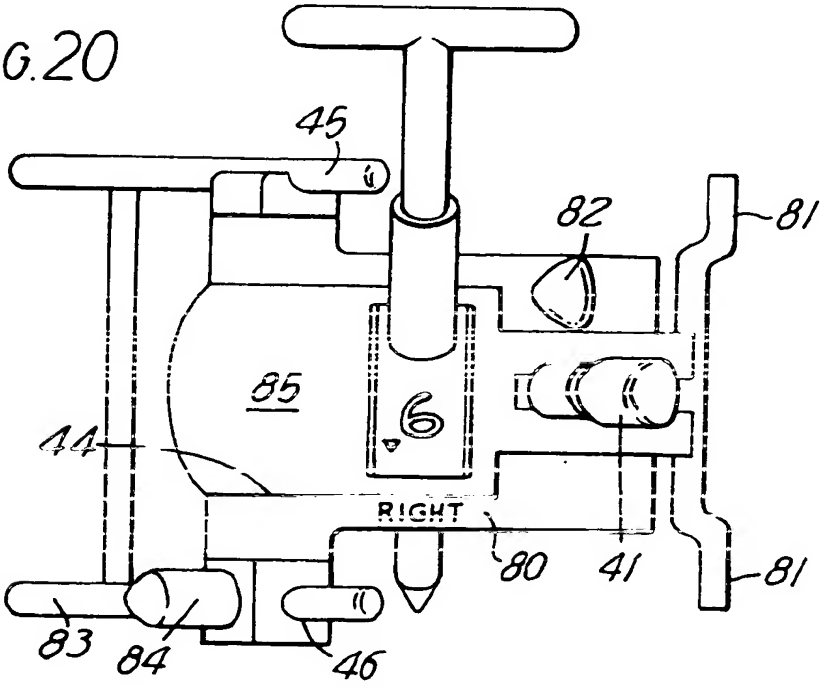
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FIG.21

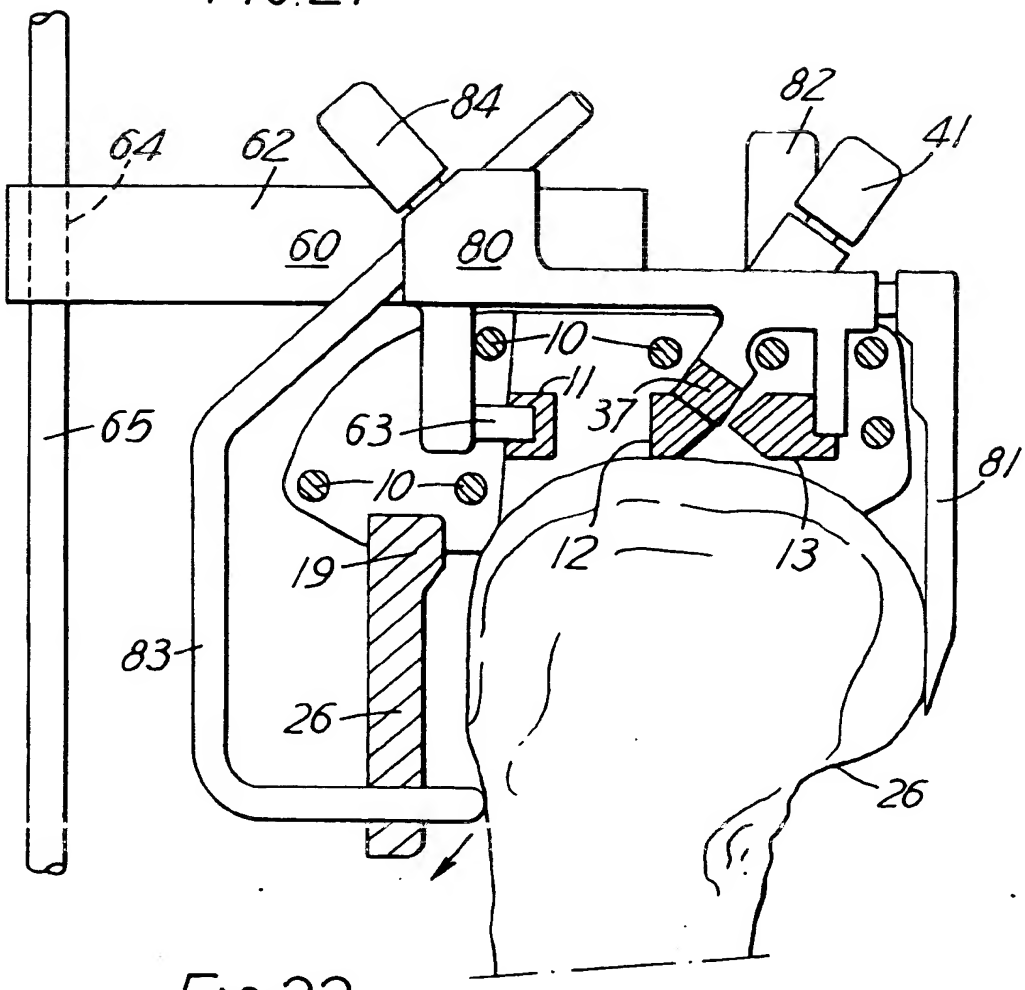
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FIG.22

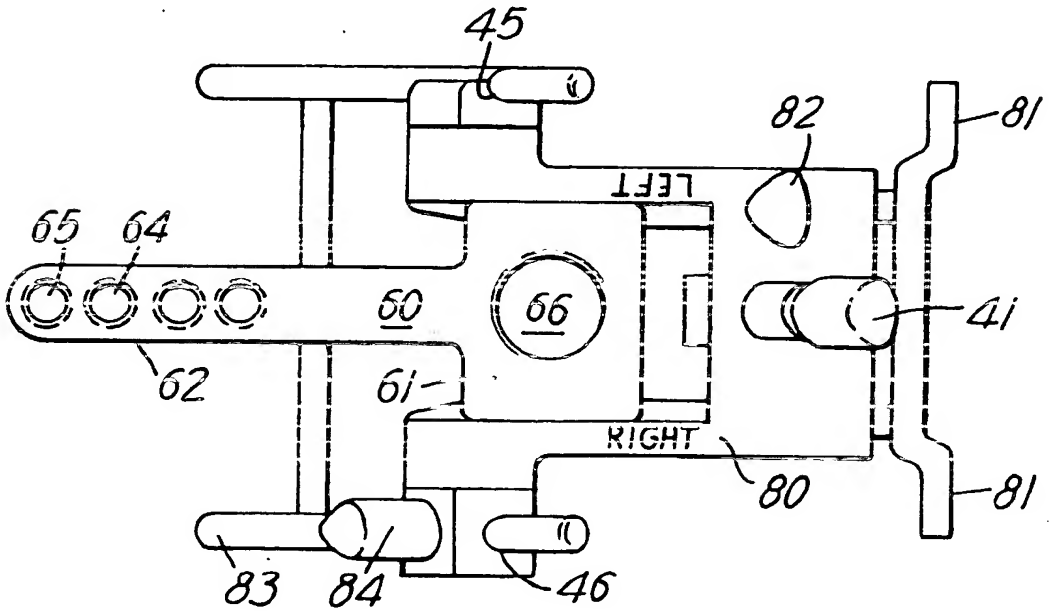
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FIG.23

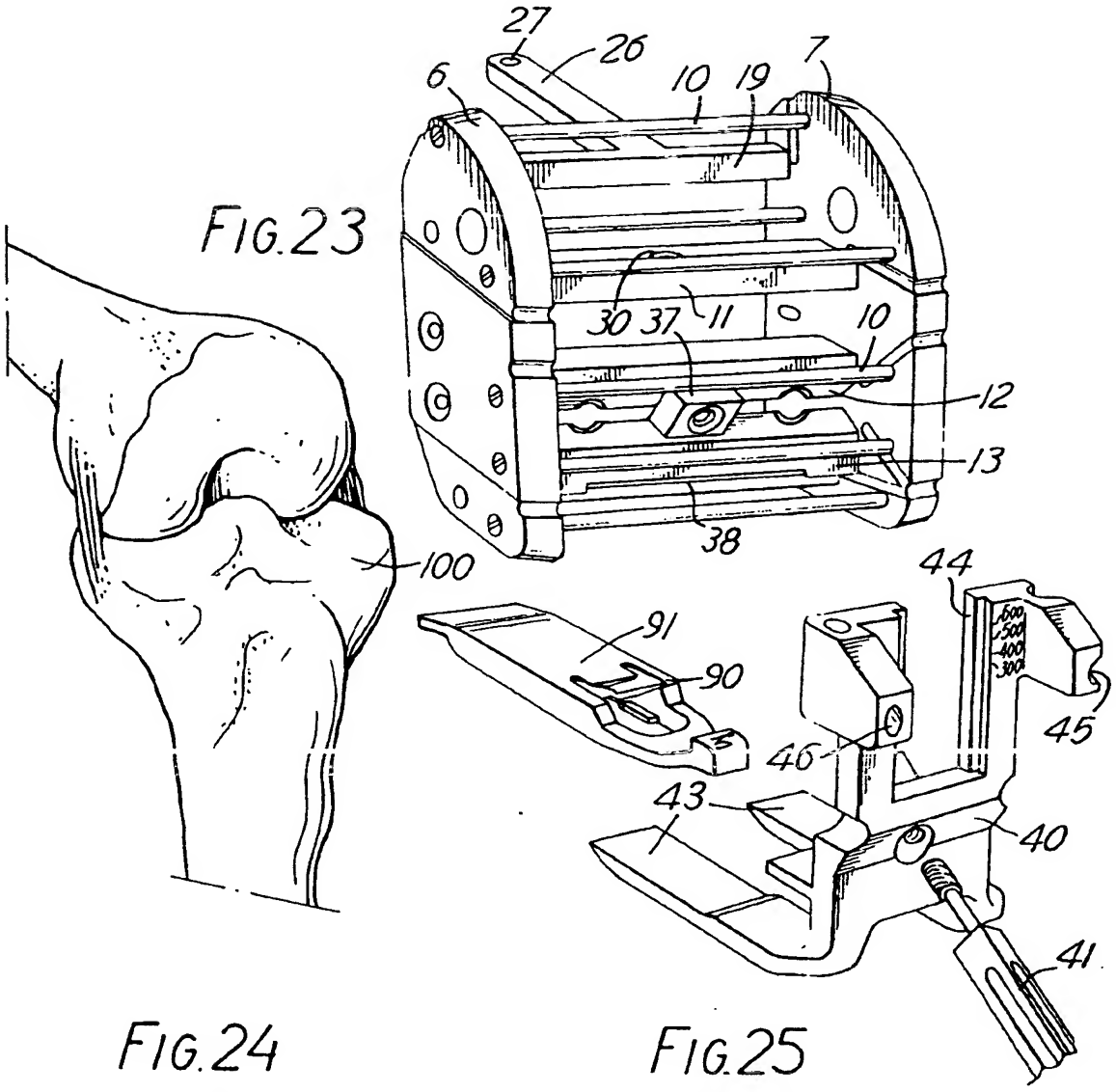


FIG.24

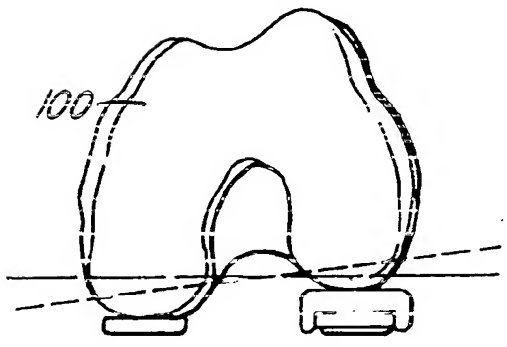
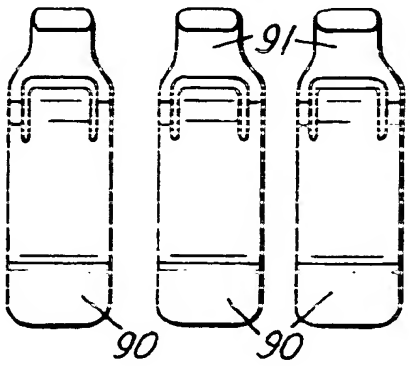


FIG.25



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 30 0589

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	FR-A-2 664 157 (JBS) * claim 1; figures 1,2 *	1	A61B17/14
A	EP-A-0 466 659 (CREMASCOLI) * abstract; figures 8,13 *	1	
A	EP-A-0 243 109 (DOW CORNING) * figure 13 *	1	
A	US-A-4 457 307 (STILLWELL) * abstract; figures 5-8 *	1	
A	EP-A-0 378 294 (DOW CORNING) * claim 4 *	1	
A	EP-A-0 340 176 (CREMASCOLI) * figures 1,9 *	1	
P,X	US-A-5 122 144 (BERT) * figures 10,19,20 *	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A61B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	01 JUNE 1993	BARTON S.

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